DEVELOPMENT OF AN ECMO TRANSPORT PROGRAM

Chief Perfusionist
St. Louis Children’s Hospital
ECMO TRANSPORT

Differences with terminology

INTER – Hospital transport

• Perform over 100 transports each year
• Cath Lab, CT, OR, changing room for census
ECMO TRANSPORT

Differences with terminology

INTRA – Hospital transport

- Perform “secondary transports”

- All have been Fixed Wing – other capabilities
PURPOSE

Transport program provides:

1. Opportunity for evaluation for possible further treatments
   1. VAD, PLAD, Transplantation

2. Offers an opportunity for 2nd opinion after being deemed ineligible by their home institutions

3. Assist outside institutions with high acuity patients
THE DESIGN GOALS:

- Need to have cooperation from all parties
- Make the process easy (anyone can do it)
- Always have a “flexible plan”

SAFETY
- Patient is the Priority – “time is secondary”
Retrospective study 2010-2016

- 536 transports performed
  - In 163 (31.7%) transports - 206 adverse events
- 134 (65%) events were patient related
- 30 (14.6%) - equipment / technical issues
- 42 (20.4%) – ambulance issues

Most of the problems appear to occur during unload/re-load procedures.
WHAT IS NEEDED?
COOPERATION MODEL

All Communication is facilitated by Children’s Direct
800.678.HELP(4357)
PRE – PROCEDURE PLANNING

All Documents located on SLCH Shared drive

- Begin ECMO Report Sheet for Critical Care Transport

<table>
<thead>
<tr>
<th>Date</th>
<th>Pt. Name</th>
<th>Ht.(cm)</th>
<th>Wt.(kg)</th>
</tr>
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<tbody>
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</table>

**Referring Hospital:**

**Travel Mode:**

**HOP/PIMH:**

**Allergies:**

**Vital Signs**

<table>
<thead>
<tr>
<th>Rhythm/Rate</th>
<th>ASB (range):</th>
<th>CVP</th>
<th>PAP</th>
<th>Temp</th>
<th>LA/other:</th>
</tr>
</thead>
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**Ventilator Settings**

**ECMO Circuit**

<table>
<thead>
<tr>
<th>VA or WW</th>
<th>Cannula Sites/ Size/Type:</th>
<th>Position on Xray:</th>
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**Time on Circuit:**

**Distal Reperfusion Cannula:** Yes / No

**Size of Circuit:**

**Pump Type:**

**Problems with circuit:**

**Any other Device (ASB, VAD, etc.):**

**ECMO Settings**

<table>
<thead>
<tr>
<th>Flow</th>
<th>RPM</th>
<th>Hb</th>
<th>Sweep</th>
<th>CO2: yes or no</th>
<th>CO2 rate</th>
</tr>
</thead>
<tbody>
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**Dropped Flow:**

<table>
<thead>
<tr>
<th>Heparin gtt</th>
<th>ATIII gtt</th>
<th>Other Anticoagulation gtt</th>
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**Drugs / Rates**

**Any drugs infusing into ECMO circuit? Yes / NO**

**LABS**

**Device type for beside monitoring:**

<table>
<thead>
<tr>
<th>ACT</th>
<th>ATIII</th>
<th>PT</th>
<th>INR</th>
<th>Ca</th>
<th>ICA</th>
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**Hepcon:**

<table>
<thead>
<tr>
<th>aPTT</th>
<th>Fibrinogen</th>
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**ABG:**

<table>
<thead>
<tr>
<th>pH</th>
<th>pCO2</th>
<th>pO2</th>
<th>HCO3</th>
<th>SVo2</th>
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**Comments:**

...
PRE – PROCEDURE PLANNING

- Pharmacy Requirements
- Referring Hospital Requirements

Referring Hospital Checklist

- Head Ultrasound (<48 hours) demonstrating absence of hemorrhage
- Cardiac ECHO (<24 Hours) with final report
- Completed lab draws <4 hrs before ECMO transport team arrival
- Foley inserted
- IV access, arterial lines, and central lines
- Parents or guardians must be aware and available for informed consent process when team arrives; they must have had an informed consent preparation discussion by the referring staff physician before launching the ECMO transport team preparations
- Drug infusions concentrations and rates notified
- Patient intubated before transport team arrival
- After transfer to new ECMO circuit – Stat labs will be required – Lactate, CBC, Fibrinogen, ACT, Hepcon (if available), ABG with ICA
- All necessary documents/charts will be photocopied and available for review before team arrival
- Inform Security of the transport to assist with in-hospital transport

Blood Requirement (< 15 kg)

- 3 units Packed Red Blood Cells (1 unit for priming)
- 1 unit Fresh Frozen Plasma
- 1 unit Platelet pheresis
- If platelet pheresis not available, 4 units single donor or pooled platelets
- Blood transport cooler with blood products in the patient’s room before team arrival
EXTRA – INSTITUTIONAL TRANSPORT DEVICE CHARACTERISTICS

- Centrifugal
- Small / compact/ light
- Safety system
- Pressure monitoring
- Ease of use
- Able to fit on a stretcher
- Able to transport easily
SLCH TRANSPORT

Cardiohelp:

1. Small /transportable- 22 kg
2. Ease of use
3. All in one system- SVO2, Hgb, Hct, Temp
4. Handcrank back up system
5. Versatile with different size of patients
6. Easily converted to bedside use
SLCH TRANSPORT

- Adapted Microtemp LT 749 Cincinnati Sub-Zero (4.1 kg)

- CareFusion Bird Low Flow Air/O2 Blender (1.25 kg - 2.5-3.5 LPM bleed on Aux right)
PATIENT CONSIDERATIONS

• Size, weight, equipment
ASSEMBLING THE COMPONENTS
INCORPORATING TRANSPORTS EQUIPMENT

Ventilator, AVL, Hemochron Jr., IV’s, NO2, monitor – other support bags
ADDITIONAL PERFUSION SUPPORT EQUIPMENT
BEFORE LEAVING SLCH

- Patient status update
- OSH checklist – blood, testing
- Pre-Transport ECMO Perfusion checklist – equipment, bags, qc’s, paperwork, CO₂, electric cords, etc.
- Pharmacy Checklist
- Cardiohelp Checklist – serial numbers, self-check, zeroing pressures, priming at SLCH, priming at OSH, initiation, before transport
- Final verbal bag count before at the ambulance bay
LOADING INTO TRANSPORT VEHICLES

MICU 1, 2, 3

Capable of carrying 8 personnel – 2 patients

- Generates own electricity
- Medical air/oxygen
- 120v inverter
FIXED-WING TRANSPORT

Pilates PC-12

1 – Pilot
4 – Medical Personnel

• Pressurized
• 120 v inverter
AT THE OSH

- Make contact with Perfusion, or ECMO specialists/coordinator
- Make contact with the patients family
CONVERSION

- Blood prime
- Exchange, stabilize patient, transfer ventilator, monitoring lines
- Transfer patient to transport sled and secure
- Complete Checklists
- Reverse Process
TRANSITION TO BEDSIDE
INTRA - HOSPITAL – CT SCANNER
SPECIFICS - CIRCUITRY PRIME

• HLS Advanced 5.0
  • Pediatric approx. 285-350 ml
  • Adult approx. 475 ml
PROGRAM STATISTICS

- 11 patients currently transported
- 3.0 kg – 85 kg

- Longest run 539’
- Shortest run 70’

- Adverse events:
  1 bleeding - open chest/pressurization, stopcock fracture
  1 ambulance issue
  2 equipment – blood box, ABG machine
TAKE HOME

• Transport is a “Team” sport
  • Organization should have resources to support different departments
  • Departments must work well with each other
• Redundancy/flexibility with systems
• Safety is the key components
• Consistently update and adjust your transport system
THANK YOU
QUESTIONS

PLEASE RESIST THE URGE TO FIDDLE WITH THE COOL MACHINES THAT KEEP HIM ALIVE.